**Option E - Environmental (SL/HL 1)**

**Option E: Environmental Chemistry (15/22 hours)**

**E1 Air pollution - 2 hours**

E.1.1 Describe the main sources of carbon monoxide (CO), oxides of nitrogen (NOx), oxides of sulfur (SOx), particulates and volatile organic compounds (VOCs) in the atmosphere. (2)

E.1.2 Evaluate current methods for the reduction of air pollution. (3)

**E2 Acid deposition - 1.5 hours**

E.2.1 State what is meant by the term acid deposition and outline its origins. (1)

E.2.2 Discuss the environmental effects of acid deposition and possible methods to counteract them. (3)

**E3 Greenhouse effect - 1.5 hours**

E.3.1 Describe the greenhouse effect. (2)

E.3.2 List the main greenhouse gases and their sources, and discuss their relative effects. (3)

E.3.3 Discuss the influence of increasing amounts of greenhouse gases on the atmosphere. (3)

**E4 Ozone depletion - 1.5 hours**

E.4.1 Describe the formation and depletion of ozone in the stratosphere by natural processes. (2)

E.4.2 List the ozone-depleting pollutants and their sources. (1)

E.4.3 Discuss the alternatives to CFCs in terms of their properties. (3)

**E5 Dissolved oxygen in water - 1.5 hours**

E.5.1 Outline biochemical oxygen demand (BOD) as a measure of oxygen demanding wastes in water. (2)

E.5.2 Distinguish between aerobic and anaerobic decomposition of organic material in water. (2)

E.5.3 Describe the process of eutrophication and its effects. (2)

E.5.4 Describe the source and effects of thermal pollution in water. (2)

**E6 Water treatment - -2.5 hours**

E.6.1 List the primary pollutants found in waste water and identify their sources. (2)

E.6.2 Outline the primary, secondary and tertiary stages of waste water treatment, and state the substance that is removed during each stage. (2)

E.6.3 Evaluate the process to obtain fresh water from sea water using multistage distillation and reverse osmosis. (3)

**E7 Soil - 2.5 hours**

E.7.1 Discuss salinization, nutrient depletion and soil pollution as causes of soil degradation. (3)

E.7.2 Describe the relevance of the soil organic matter (SOM) in preventing soil degradation, and outline its physical and biological functions. (2)

E.7.3 List common organic soil pollutants and their sources. (1)

**E8 Waste - 2 hours**

E.8.1 Outline and compare the various methods for waste disposal. (3)

E.8.2 Describe the recycling of metal, glass, plastic and paper products, and outline its benefits. (2)

E.8.3 Describe the characteristics and sources of different types of radioactive waste. (2)

E.8.4 Compare the storage and disposal methods for different types of radioactive waste. (3)

**E9 Ozone depletion - 1 hour**

E.9.1 Explain the dependence of O2 and O3 dissociation on the wavelength of light. (3)

E.9.2 Describe the mechanism in the catalysis of O3 depletion by CFCs and NOx. (2)

E.9.3 Outline the reasons for greater ozone depletion in polar regions. (2)

**Topics E10-E12 HL Only Material**

**E10 Smog - 2 hours**

E.10.1 State the source of primary pollutants and the conditions necessary for the formation of photochemical smog. (1)

E.10.2 Outline the formation of secondary pollutants in photochemical smog. (2)

**E11 Acid deposition - 1 hour**

E.11.1 Describe the mechanism of acid deposition caused by the oxides of nitrogen and oxides of sulfur. (2)

E.11.2 Explain the role of ammonia in acid deposition. (3)

**E12 Water and soil - 3 hours**

E.12.1 Solve problems relating to the removal of heavy-metal ions, phosphates and nitrates from water

by chemical precipitation. (3)

E.12.2 State what is meant by the term cation-exchange capacity (CEC) and outline its importance. (2)

E.12.3 Discuss the effects of soil pH on cation-exchange capacity and availability of nutrients. (3)